

Do U.S. Nuclear Weapons Have a Future?

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by [James J. Wirtz](#)

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Introduction

In May 2005, senior administrators at Lawrence Livermore, Los Alamos, and Sandia National Laboratories issued a white paper titled "Sustaining the Nuclear Enterprise—a New Approach."^[1] The paper reflects the impact of the U.S. nuclear test moratorium, in place since 1992, and the growing incompatibility between two national objectives:

- (a) slowing horizontal and vertical nuclear proliferation, and
- (b) preserving an effective U.S. nuclear deterrent for the indefinite future.

The effects of the nuclear test moratorium, which have been reinforced by the 1996 Comprehensive Test Ban Treaty (CTBT), have been mitigated in the United States by the Nuclear Stockpile Stewardship Program (SSP), which was intended to extend the service life of the U.S. nuclear stockpile. Despite the surety and maintenance programs embodied within stockpile stewardship, however, National Laboratory administrators warn that SSP is an expensive endeavor that will fail gracefully in the effort to extend the useful life of U.S. nuclear weapons.

Whatever one's views about the morality of nuclear deterrence or the desirability of nuclear disarmament, the challenges facing the SSP highlights the danger of failing to recognize value tradeoffs—the fact that opportunity costs are inherent in all actions—when formulating public policy.

In the immediate aftermath of the Cold War, both the United States and Russia took steps to reduce their huge nuclear arsenals. Both countries possessed a surplus of nuclear weapons, and given their improving political relations, they had little motivation to continue with their existing nuclear force modernization programs. Forces were de-alerted, de-targeted and retired.

As part of this nuclear draw down, the George H.W. Bush administration announced a unilateral testing moratorium on October 2, 1992 that was subsequently extended by the Clinton administration until the United States formally committed itself to halt nuclear testing by signing of the CTBT.^[2]

The Soviet Union/Russia conducted its last nuclear test in October 1990, Great Britain ended testing in November 1991, and France and China both conducted their last nuclear tests in January 1996. Although India and Pakistani conducted nuclear tests in 1998, the shock they delivered to the global nonproliferation regime was not sufficient to upset the test moratorium among the other nuclear powers. Despite ongoing concerns about North Korean and Iranian nuclear programs and revelations about A.Q. Khan's clandestine nuclear supply network, the nuclear programs of the existing nuclear powers have exhibited diminishing levels of activity over the last decade.

Nuclear test moratoria and more formal test-ban treaties are disarmament measures, although segments of the U.S. government have failed to recognize this reality. Government advocates of these measures often state that they are intended to stop the horizontal spread of nuclear weapons to new parties and vertical proliferation by halting nuclear force modernization among existing nuclear powers. They also claim that the United States could use advanced modeling and its existing nuclear research establishment to maintain a nuclear deterrent indefinitely. Over time, however, a testing moratorium will slowly undermine the capability of even the most advanced nuclear state to maintain a nuclear arsenal.

Test-ban proponents, especially when addressing other disarmament supporters, often do admit that a test moratorium eventually will lead to disarmament, and trends support their theoretical observations and policy prescriptions. Nuclear physics and weapons engineering are living arts; know-how is learned from hands-on experience with real weapons and is passed along to the next generation of scientists and engineers as they work with their senior colleagues.

A moratorium breaks this chain by effectively ending this apprentice system. Important knowledge also is lost as experienced engineers and scientists retire. Manufacturing and design knowledge can never be fully captured by blueprints or even in the most detailed commentary that might accompany design specifications. Without ongoing design and manufacturing work, maintenance of existing weapons becomes increasingly difficult as components become unavailable when suppliers go out of business or abandon product lines. Over a few short decades, the design, engineering, and manufacturing resources needed to maintain existing weapons begin to dissipate.

To reap the nonproliferation benefits created by a nuclear testing moratorium, while still enjoying the security provided by a robust nuclear deterrent, the Clinton administration started the SSP. The SSP is intended to extend the life of Cold War surplus weapons by certifying their continued safety and functionality until 2040.

By maintaining a large reserve of nuclear weapons, U.S. officials intended to guard against unforeseen technical problems in their deployed nuclear forces and to greatly reduce the U.S. weapons design and manufacturing infrastructure. Instead of building new nuclear weapons, the decision was made to retain the entire Cold War stockpile of certain types of nuclear weapons, maintaining them as long as possible to be prepared for unforeseen technical problems in the deployed nuclear arsenal or international contingencies (e.g., an effort by another great power to increase rapidly its deployed nuclear forces).

This Life Extension Program (LEP) has already completed the refurbishment of the W87 warhead, designed for intercontinental-ballistic missiles. The W87 can now remain in the stockpile until 2030. LEP also is underway to extend the service life of the B61 series of nuclear gravity bombs and the W76 warhead, which is deployed on submarine-launched ballistic missiles.

The SSP program has worked reasonably well to date, but scientists and engineers have encountered a fundamental limitation in terms of extending the life of existing U.S. nuclear warheads. The last generation of U.S. nuclear warheads, which were designed in the early 1980s,

was built to optimize yield-to-weight ratios. Because it was assumed that these weapons would only be in the stockpile for ten to twenty years before being replaced by a new generation of weapons, and because it was assumed that nuclear testing could be undertaken to guarantee their performance, they were constructed with high tolerances and relatively small performance margins.

Additionally, some materials and manufacturing processes that were used thirty years ago are no longer commercially available, forcing engineers to begin to incorporate new processes and materials into refurbished warheads. Doubts are beginning to emerge about how the introduction of new components or systems might affect the performance of these weapons. In other words, the newest U.S. nuclear warheads are particularly ill-suited for service life extension; National Laboratory administrations are warning that the safety, reliability and performance of U.S. nuclear weapons will begin to deteriorate no matter how much time or money is expended to preserve them.

The Bush administration's first response to this situation, contained in the 2001 Nuclear Posture Review, was a call for a new nuclear triad, which would consist of active defenses, a robust nuclear infrastructure, and strike options that incorporated precision-conventional weapons into the strategic deterrent.^[3] Simultaneously, administration officials proposed studies on new low-yield, nuclear weapons that would be designed to hold deeply buried targets at risk or to minimize collateral damage in a U.S. nuclear strike, thereby increasing the credibility of U.S. nuclear deterrence.^[4] But there was little Congressional support for production new nuclear warheads.

The current White Paper issued by the National Laboratories thus marks a shift in the Bush administration's approach to the issue of U.S. nuclear force modernization. Instead of advocating the construction of new warheads that fit a strategic concept or respond to perceived international threats (e.g., the spread of weapons of mass destruction to "rogue" states), the National Laboratories and the administration have admitted that the SSP and the LEP cannot maintain the current U.S. nuclear inventory indefinitely.

Whether or not one considers the current dilemma faced by U.S. officials an intended or unintended consequence of decisions made by both Republican and Democratic administrations in the early 1990s, two observations can be offered about the current status of U.S. nuclear weapons maintenance and procurement policy.

First, officials failed to recognize that there was a difference between the immediate and long-term impact of the decision to suspend nuclear testing. The downsizing or retiring of significant portions of the U.S. nuclear arsenal at the end of the Cold War made perfect sense. Cutting spending on nuclear forces, terminating nuclear force modernization, and ending nuclear testing were all seen as part of the effort to retire Cold War surplus weapons. But suspending nuclear testing was more than just a good cost cutting measure, or part of an effort to abandon weapons that were no longer needed. Instead, it reduced the United States' capability to maintain and reconstitute a nuclear arsenal. A decision that seemed relatively innocuous turned out to be far more significant because officials failed to realize the long-term opportunity costs of their policy. Policymakers attempted to mitigate these opportunity costs through the SSP and LEP, but it now appears that the balance is beginning to tip fundamentally between the ability of the United States to pursue nuclear disarmament and deterrence simultaneously. In the end, it is impossible to disarm and remain armed at the same time.

Second, policymakers apparently never understood how the technical characteristics of the latest generation of U.S. nuclear weapons actually made them poor candidates for SSP. Designed and built to create the maximum yield with minimum size and weight, U.S. nuclear weapons are probably some of the most complex and exacting machines ever created. Built from exotic materials and components that have little civilian application, they present engineers with significant maintenance challenges. To best prepare for nuclear force reductions and a nuclear

test moratorium, scientists and engineers probably should have quickly designed and tested a new generation of nuclear warheads designed for easy maintenance, high security, and long service lifetimes. A decision to prepare for what amounted to gradual nuclear disarmament by developing a new nuclear weapon would have been difficult to explain, if not politically implausible in the early 1990s. Such a decision would have required an honest appraisal of the opportunity costs involved in the decision to abandon nuclear testing. But these types of assessments were not a pressing concern in the euphoria that accompanied the end of the Cold War.

Will the scientists and engineers at the National Laboratories receive Congressional authorization and funding to construct a new generation of nuclear weapons? Can these weapons be built without testing? It is impossible to answer these questions, but it appears that an improved SSP that requires the design and construction of new nuclear weapons is unlikely to gain much support in the current political climate.

But politics can change. A significant external shock—the resumption of nuclear testing by another party, the acquisition or use of weapons of mass destruction by a state or non-state actor—could quickly change Congressional and public attitudes toward the U.S. nuclear program. Until then, officials will have to live with the fact that despite much rhetoric about deterrence and acute threats posed by the presence of nuclear, chemical, and biological weapons, disarmament is the dominant feature of U.S. nuclear policy.

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References

1. Bruce T. Goodwin, Frederick A. Tarantino, and John B. Woodward, "[Sustaining the Nuclear Enterprise—a New Approach](#)," UCRL-AR-212442; LAUR-05-3830; and SAND2005-3384, May 20, 2005.
2. Although the U.S. Senate failed to ratify the CTBT on October 13, 1999, the United States continues to adhere to the nuclear test moratorium.
3. For an overview of the 2001 Nuclear Posture Review and an assessment of Bush administration efforts to implement a new nuclear doctrine see "[The Transformation of U.S. Nuclear Strategy](#)," *IISS Strategic Survey 2003/4* (Oxford University Press, 2004).
4. James J. Wirtz and Jeffrey Larsen, eds., [Nuclear Transformation: The New U.S. Nuclear Doctrine](#) (New York: Palgrave MacMillan, 2005).